Conclusion: Automatic quantification of color Doppler M-mode patterns is feasible, with no influence from respiration with regards to the flow propagation velocity features. This analysis shows promising results to differentiate normal LV diastolic filling patterns from pathological filling.

1070-24 Mitral Regurgitation Index: A Composite of Clinical Factors to Measure Severity

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Echocardiographic quantitation of mitral regurgitation (MR) is challenging and determination of MR severity is largely qualitative. We hypothesized that commonly accepted qualitative echocardiographic variables could be combined to create a valid semi-quantitative index of MR severity.

To derive the 'MR Index', 6 variables were scored on a scale of 0–3 and averaged: jet propagation, proximal isovelocity surface area diameter (PISA), continuous wave Doppler jet density (CW), pulmonary venous (PV) flow pattern, pulmonary hypertension and left atrial size (LA). The 'MR Index' was compared to echocardiographic regurgitant fraction and to the qualitative echocardiographic grade of MR (mild, moderate, severe) judged by an expert observer. 40 pts with normal ejection fraction were identified from the UCSF 1994 ECHO database (10 in each category – normal controls, mild, moderate and severe MR). The MR index correlated with regurgitant fraction ($r = 0.87$, $p < 0.0001$) and all six variables were univariate predictors of regurgitant fraction ($p < 0.01$, Spearman Rank). Likewise, the MR index showed good correlation to the expert MR grade ($p < 0.0001$, Kruskal Wallis) In a multivariate regression model ($r^2 = 0.74$, $p < 0.0001$), the PV flow and jet were significant predictors of regurgitant fraction. Stepwise multivariate (forward and backward) regression confirmed their significance and yielded the equation: RF = 16.5 (Jet) + 9.0 (PV flow) − 11.8; [$r^2 = 0.76$, $p < 0.0001$]. In a multivariate regression model to predict MR severity based on clinical grade, 5 of the variables were significant and a stepwise model generated the equation: Grade = 0. 48 + 0.24 (Jet) + 0.24 (PISA) + 0.35 (CW) + 0.25 (PV flow) + 0.23 (LA); [$r^2 = 0.95$, $p < 0.0001$].

Conclusion: Our retrospective analysis suggests that this MR index is a valid predictor of MR severity and can be applied as a semi-quantitative measure. Prospective studies are needed to test its clinical utility in research and management of patients with mitral regurgitation.

1071 Echocardiography: The Left Atrium

Wednesday, March 19, 1997, Noon–2:00 p.m.
Anaheim Convention Center, Hall E
Presentation Hour: 1:00 p.m.–2:00 p.m.

1071-38 Different Mode of Recovery of Atrial Contraction Between the Right and Left Atria After Maze Procedure: Dependence on Disease Etiology

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Maze procedure, a new surgical treatment for chronic atrial fibrillation, has been reported to be effective to restore *regular rhythm* in most patients. It has been applied not only to lone atrial fibrillation but also to that concomitant with other cardiac diseases such as valvular disease and congenital heart disease. However, little is known about recovery of *active atrial contraction* and the influence of disease etiology on the recovery.

Methods: We serially (1, 6 and 12 months after the procedure) measured transmitral and transtricuspid flow velocity using Doppler echocardiography in 29 patients after Maze procedure. The cause of atrial fibrillation was LA overload in 19 patients with mitral valvular disease (LAO) and RA overload in 10 with atrial septal defect (RAO). Active atrial contraction was defined as the peak velocity of late diastolic filling over 5 cm/s for both atria. LA and RA contribution to diastolic filling (L-AC, R-AC) was calculated as a fraction of time velocity integral of late diastolic filling to that of total diastolic filling.

Results: (see table). Both atrial active contraction recovered with time, appearing in 58%, 60% within 1 month and 84%, 90% after 12 months in LAO and RAO, respectively (mean ± SE).

		1 month	6 months	12 months
LAO	L-AC (%)	20 ± 4	18 ± 3	18 ± 3
	R-AC (%)	27 ± 4	41 ± 5#	43 ± 5*#
RAO	L-AC (%)	19 ± 5	32 ± 3†	30 ± 6
	R-AC (%)	21 ± 5	26 ± 8	30 ± 8

*$p < 0.05$ vs 1 month, #$p < 0.001$ vs L-AC, †$p < 0.05$ vs LAO.

Conclusions: 1) Recovery of atrial contraction depended on disease etiology: patients with LA overload showed predominant recovery in RA contraction and those with RA overload showed remarkable recovery in LA contraction. 2) When evaluating recovery of atrial function after Maze procedure, disease etiology should be considered.

1071-39 Automated Boundary Detection for Left Atrial Area in Patients with Maze Procedure for Atrial Fibrillation

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Echocardiographic automated boundary detection (ABD) allows instantaneous measurement of chamber areas. The Maze procedure eliminates atrial fibrillation and preserves atrial contraction. To evaluate left atrial (LA) contraction pre and post Maze procedure with ABD and to compare with conventional echo methods. LA and RA systolic and diastolic areas were taken in the apical 4-, 2-chamber, parasternal long and short axis views using both conventional echo with hand tracing (Hand) methods and ABD within one week prior to and 8 ± 10 months after Maze from 42 patients (31 males, mean age 54 ± 11 years). Data are presented as mean ± SD. Hand and ABD measurements for fractional area change (FAC) are correlated. Data on RA changes and LA data from other windows paralleled the data below.

	LA area (Hand, cm^2)			LA area (ABD, cm^2)			r (Hand vs ABD)	
	Max	Min	FAC (%)	Max	Min	FAC (%)	Max	Min
Pre	34 ± 16*	30 ± 14*	14 ± 1	32 ± 13*	25 ± 13*	23 ± 1	0.96	0.97
Post	24 ± 6	20 ± 5	15 ± 1	23 ± 5	17 ± 5	25 ± 1	0.89	0.82

*$p < 0.001$ for pre and post Maze.

Total (Pre and Post) Comparison from Four Chamber:

	Hand (cm^2)	ABD (cm^2)	ΔArea (cm^2)	r
LA Maximum	28 ± 10	28 ± 9	0.14 ± 5	0.86
Minimum	24 ± 9	21 ± 9	3 ± 4.6	0.87
RA Maximum	22 ± 6	22 ± 6	0.2 ± 4.5	0.71
Minimum	19 ± 5	17 ± 6	2 ± 5.4	0.69

Conclusions: Both 2D and ABD methods show that left atrial areas are significantly reduced by Maze procedure. LA fractional area changes is accurate and more easily done by ABD, a simple and sensitive noninvasive technique for atrial area measurement.

1071-40 Left Atrial Dysfunction in Left Ventricular Restrictive Physiology

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Background: Doppler mitral inflow at atrial systole is reduced in pts with dilated cardiomyopathy (DC) and restrictive left ventricular (LV) filling. However, loss of left atrial (LA) systole may worsen heart failure. To test the hypothesis that LA function may not be adequately described by Doppler flow in pts with restrictive filling, we measured LA area changes using echocardiographic automated boundary detection (ABD). *Methods:* In 20 pts with DC (EF < 40%), 10 with restrictive (peak E/A > 1.2, E deceleration time < 150 ms) and 10 age-matched with non restrictive LV filling, and in 20 control subjects, we used ABD (4-chamber view) to measure: LA maximum and minimum areas (cm^2); their difference as LA filling; LA systolic emptying area change (SAC, cm^2 = area at EKG P wave-minimum); LA systolic emptying normalized by filling (SAC/LA filling × 100, %). We also measured Doppler mitral atrial filling fraction (A integral/total integral × 100, %). *Results:* (table). In pts with restrictive physiology, LA areas were larger and LA filling smaller. LA systolic emptying was reduced, but when normalized to LA filling was not different from that of the other two groups. Atrial filling fraction was increased in non restrictive and reduced in restrictive pts. *Conclusions:* In restrictive DC, the left atrium is larger and fills less than in pts without restrictive physiology. Though LA systolic emptying is also reduced, it may still account for as much as half of the total LA change in dimension, the difference compared to the

	Max Area	Min Area	LA filling	SAC SAC	SAC normalized	Doppler atrial filling fract.
Controls	17 ± 4	11 ± 4	7 ± 2	3.0 ± 2	45 ± 16	31 ± 9
Non restrictive	21 ± 7	15 ± 7	6 ± 3	3.0 ± 1	50 ± 16	49 ± 15*
Restrictive	26 ± 7*	22 ± 7*#	4 ± 2*	1.6 ± 1*#	49 ± 39	24 ± 7*#

$p < 0.05$ *vs. Controls #vs. Non restrictive